Claims

[c1]   1. A method for determining and updating a projected strategy for maintaining

optimal operations of a nuclear reactor based on one or more optimization

input parameters and/or reactor state-point information stored in a database,

comprising the steps performed by a computer or computer network of:

a) accepting input data for initializing or modifying one or more

optimization input parameter values which collectively define a particular

reactor operation strategy;

b) computing optimized quantitative values for a plurality of reactor core

operational control-variables based on current reactor plant state-point

data, wherein the computed optimized quantitative values meet

predetermined design constraints for the reactor; and

c) displaying, on a display device coupled to said computer or computer

network, at least one or more of said computed optimized quantitative

control-variable values, said information being indicative of a projected

strategy for optimal reactor performance.

[c2]   2. The method of claim 1 further including the step of computing optimal

reactor simulation results based on optimized quantitative values computed in

step (b).

[c3]   3. The method of claim 1 wherein the step of computing optimized quantitative

values for a plurality of reactor core operational control-variables further

comprises computing polynomial response surface data based on a plurality of

reactor core operation simulations.

[c4]   4. The method of claim 1 wherein the step of computing optimized quantitative

values for a plurality of reactor core operational control-variables further

comprises using predetermined polynomial response surface data to predict

optimal changes in independent control-variable values, said polynomial

response surface data based on a plurality of reactor core operation

simulations.

[c5]   5. The method of claim 1 further including the step of periodically computing

updated values for one or more optimization inputs in accordance with a

current time and/or a time remaining in a current fuel cycle.

[c6]   6. The method of claim 1 wherein optimization input data of step (a) comprises predetermined stored optimization input parameter values which collectively define a preferred operational strategy.

[c7]   7. The method of claim 6 wherein a stored reactor operational strategy incorporates reactor plant licensing requirements.

[c8]   8. The method of claim 1 wherein optimization input data of step (a) is automatically retrieved from a database of optimization input data.

[c9]   9. The method of claim 1 wherein optimization input data of step (a) is manually input by a user.

[c10]   10. The method of claim 1 further including the step of selectively displaying historical and/or current reactor plant performance data.

[c11]   11. The method of claim 1 wherein computation of optimized control-variables is performed in response to changes made to an existing or preferred reactor operational strategy.

[c12]   12. The method of claim 1 further including the step of converting thermal and/or reactivity margin data into fuel cycle energy data.

[c13]   13. The method of claim 1 further including the step of converting reactor fuel cycle energy data into thermal and/or reactivity margin data for subsequent display via graphical user interface.

[c14]   14. The method of claim 1 wherein computing optimized quantitative values for one or more reactor core operational control-variables is performed in response to poor or inadequate process computer and/or design simulator predictions.

[c15]   15. The method of claim 1 wherein computing optimized quantitative values for one or more reactor core operational control-variables is performed for a reactor during a given fuel cycle, N, so as to improve efficiency of reactor operations for a subsequent fuel cycle, N+1.

[c16]   16. The method of claim 1 wherein the step of computing optimized quantitative values for one or more reactor core operational control-variables is performed and/or an optimal projected reactor operational strategy is displayed in direct response to one or more specific commands input via graphical user interface.

[c17]   17. The method of claim 1 wherein the step of computing optimized quantitative values includes displaying all independent control variables via graphical user interface.

[c18]   18. The method of claim 1 wherein the step of computing optimized quantitative values includes utilizing exposure dependent constraints.

[c19]   19. The method of claim 1 wherein the step of computing optimized quantitative values includes providing multiple solutions from varying constraint criteria.

[c20]   20. The method of claim 1 wherein the step of computing optimized quantitative values includes performing computations based upon a user selected extended reactor fuel cycle duration value.

[c21]   21. The method of claim 1 further including the step of computing a maximum fuel cycle energy corresponding to a particular reduced coolant flow capability.

[c22]   22. The method of claim 1 further including the step of performing a coastdown reduction computation.

[c23]   23. The method of claim 1 further including the step of computing a maximum undisturbed sequence length.

[c24]   24. A nuclear reactor operations optimization system for determining and updating one or more strategies for optimal operations of a nuclear reactor plant based on one or more optimization input parameters and/or reactor state-point information stored in a database, comprising:

        a plurality of optimization system host processors coupled via a digital communications network, at least one or more of said host processors operative as a control-variable optimization engine and at least one or

more of said host processors providing a graphic user interface for selecting optimization inputs and inputting associated parameter values and/or displaying information indicative of an optimized operational strategy based on optimization output results provided by the optimization engine; and

a database storage device accessible by one or more of said host processors via the communications network for storage of optimization inputs and parameter values.

[c25]   25. The reactor operations optimization system of claim 24 wherein at least one or more of said host processors process one or more reactor core operation simulation cases corresponding to a predetermined set of independent control-variable values.

[c26]   26. The reactor operations optimization system of claim 24 wherein reactor state-point information is produced by a reactor simulation process performed by one or more of processors connected to the network and is stored in a database accessible via the communications network.

[c27]   27. The system of claim 24 wherein the communications network comprises a LAN.

[c28]   28. The system of claim 24 wherein the communications network comprises a WAN.

[c29]   29. The system of claim 24 wherein the communications network comprises, at least in part, existing Internet communications infrastructure.

[c30]   30. The system of claim 24 wherein the display device includes a graphical user interface that enables retrieval and selective display of historical and/or current reactor plant performance data stored on one or more storage devices accessible via the communications network.